INDOOR AIR QUALITY ASSESSMENT

Boston Public Library
Upham's Corner Branch
500 Columbia Road
Dorchester, Massachusetts

Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
January 2018

Background

Building:	Boston Public Library (BPL). Upham's Corner Branch (UC)
Address:	Upham's Corner Municipal Building 500 Columbia Road, Dorchester, MA
Assessment Requested by:	Boston Public Health Commission
Reason for Request:	General indoor air quality (IAQ) and bedbugs
Date of Assessment:	November 2, 2017
Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:	Michael Feeney, Director, IAQ Program
Building Description:	The building was originally constructed as a gymnasium, library, and indoor pool with locker rooms. The current library branch occupies two floors. The upper floor is the original location for the library; the lower floor is the children's library section that exists inside the former indoor pool area.
Building Population:	Approximately 5 employees
Year of Construction:	1903 with renovations done in 1989
Windows:	Openable

Introduction

The IAQ Program was contacted regarding reports of UC employee health concerns. A consultant (OccuHealth) was hired to assess employee complaints of itching and feelings of pin pricks on the skin. Subsequent to that assessment, it was reported that a bed bug was found in the UC upper story resulting in closure for bedbug inspection and treatment. The IAQ Program met with BPL officials to assess the library prior to its reopening on the day of the visit and to identify other conditions that may have contributed to the reported symptoms. The assessment was limited to UC employee-accessible locations only. Conditions on the third and second floors as well as the health clinic in the basement were not assessed.

Methods

Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015).

IAQ Testing Results

The following is a summary of indoor air testing results (Table 1).

- ***Carbon dioxide levels*** were below 800 parts per million (ppm) in all areas, indicating adequate fresh air in the space at the time of this assessment.
- ***Temperature*** was within or just below the recommended range of 70°F to 78°F in all areas assessed.
- ***Relative humidity*** was within the recommended range of 40% to 60% in all areas assessed.
- ***Carbon monoxide*** levels were non-detectable in all areas assessed.
- ***Fine particulate matter (PM2.5)*** concentrations measured were below the National Ambient Air Quality Standard (NAAQS) level of 35 $\mu g/m^3$ in all areas assessed.

Ventilation

The assessment results indicate that the ventilation system is providing adequate fresh air for the occupancy in the building. Note that many areas had low occupancy, which can reduce the creation of carbon dioxide. To maximize air exchange, BEH recommends that mechanical ventilation systems operate continuously during periods of occupancy. Without the system operating as designed, normally occurring pollutants cannot be diluted or removed, allowing them to build up and lead to IAQ/comfort complaints.

A heating, ventilating, and air conditioning (HVAC) system has several functions. First it provides heating and, if equipped, cooling. Second, it is a source of fresh air. Finally, an HVAC system will dilute and remove normally occurring indoor environmental pollutants by not only introducing fresh air, but by filtering the airstream and ejecting stale air to the outdoors via exhaust ventilation. Even if an HVAC system is operating as designed, point sources of respiratory irritation may exist and cause symptoms in sensitive individuals. The following analysis examines and identifies components of the HVAC system and likely sources of

respiratory irritant/allergen exposure due to water damage, aerosolized dust, and/or chemicals found in the indoor environment.

The UC does not have a mechanical ventilation system that provides fresh air. The original natural gravity ventilation system that was part of the building when it was constructed in 1903 was abandoned and sealed. The sole source of fresh air in the UC is openable windows. The UC is equipped with two free standing air handling units (AHUs) that provide air conditioning in hot humid weather only (Picture 1).

Microbial/Moisture Concerns

As noted previously, the lower level of the library was formerly an indoor pool that was constructed in 1903 (Picture 2). Along the walls of the former pool are four basins that have drains (Pictures 3 and 4). The floor of the pool also has drains (Picture 5). The purpose of each drain was to remove standing water from the floors as well as to maintain the level of water in the pool. Due to the age of the building, it is likely that none of the drains have a trap. The purpose of the trap is to prevent air from the sewer system from backing up the drains into occupied space. Traps work by holding water in the u-bend of a pipe which forms an airtight seal. If the trap has no water in its u-bend or no traps exist in the pipe, odors from the sewer can enter. Rain can cause surcharging of sewers leading to a greater likelihood of odors inside. UC staff reported that odors are noticeable in the children's area during rainstorms.

UC staff also report that the ground floor has become flooded after heavy rains. Outside the windows of the library is a cement pit with a drain. In addition, the clinic on the ground floor has a ramp that has an interceptor drain in front of the door (Picture 6). If rainfall exceeds the capacity for drains, water can fill up in the cement lined pit as well as the bottom of the access ramp which then can enter the interior of the building through the exterior access door. Given that increasing the drainage capacity would be a major project, means to prevent water from accumulating within each structure should be considered.

Conclusions/Recommendations

Based on observations at the time of assessment, the following is recommended:

1. Seal all unused drains in the children's room.

2. Since the UC has an abandoned gravity vent system, any remaining vents on both levels should be sealed.
3. Use openable windows for fresh air; however keep windows closed when air conditioning is operating.
4. Improve drainage from the cement-lined pit and access ramp. Installation of an awning to protect the access ramp from heavy rains should be considered.
5. Refer to resource manual and other related IAQ documents located on the MDPH's website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: http://mass.gov/dph/iaq.

References

MDPH. 2015. Massachusetts Department of Public Health. Indoor Air Quality Manual: Chapters I-III. Available at: http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-manual/.

Picture 1

AHU with dehumidifier in the foreground

Picture 2

Children's room, the marble floor was originally the bottom of the indoor pool

Picture 3

Basin in wall of pool

Picture 4

Open drain in basin

Picture 5

Floor drain

Picture 6

Interceptor drain at bottom of ramp in front of health center door

Location: Boston Public Library, Upham's Corner Branch **Indoor Air Results**

Address: 500 Columbia Road, Dorchester, MA **Table 1** **Date: 11/2/2017**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Background / outdoors	369	ND	65	72	9					
Main room	485	ND	70	46	7	2	Yes	No	No	
The library lobby	437	ND	69	59	5	0	No	No	No	
Office	448	ND	72	51	6	0	Yes	No	No	
Back hallway	469	ND	73	51	11	0	Yes	No	No	
Children's room upper floor	483	ND	73	53	17	0	Yes	No	No	Window-mounted air conditioner
Children's room lower floor	455	ND	73	54	18	0	Yes	No	No	
Meeting room	398	ND	73	57	9	0	No	No	No	
Restroom	383	ND	72	58	8	0	Yes	No	No	Window-mounted air conditioner

$\mu g/m^3$ = micrograms per cubic meter ND = non-detect ppm = parts per million

Comfort Guidelines

Carbon Dioxide:	< 800 ppm = preferable	Temperature:	70 - 78 °F
	> 800 ppm = indicative of ventilation problems	Relative Humidity:	40 - 60%